



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 2  
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**MEMORANDUM**

**DATE:** January 18, 2001

**SUBJECT:** National Remedy Review Board Recommendations for the  
Hudson River PCBs Site

**FROM:** Richard L. Caspe, Director  
Emergency and Remedial Response Division

**TO:** Bruce K. Means, Chair  
National Remedy Review Board

I am writing in regard to the advisory recommendations provided by the National Remedy Review Board in connection with its review of the proposed cleanup action for the Hudson River PCBs Site. The proposed remedy for the site includes the targeted dredging of PCB-contaminated sediments in the Upper Hudson, followed by limited treatment, transportation by rail and off-site disposal of the dredged sediments, and site restoration. Monitored natural attenuation (MNA) and institutional controls are also components of the proposed remedy.

The Board documented its recommendations in a memorandum to the Region, dated December 5, 2000. Each of the Board's recommendations is provided below in the order presented in the December 5 memorandum, followed by the Region's response.

- **The Board recognizes that successful implementation of the remedy in the Upper Hudson is dependent upon additional upstream source control actions at the GE facilities and, in particular, the anticipated action at the GE Hudson Falls plant. The Board supports source control actions at these facilities, as well as in the river sediments themselves, to reduce the inflow of PCBs into the Hudson and their transport down river.**

The Region acknowledges the Board's support for both the upstream source control and the targeted dredging of the PCB-contaminated river sediments.

*– Pre-decisional; not for distribution –*

- **The Board notes that the alternatives evaluation presented is based largely on human health concerns. Since the river is also a valuable ecological resource, the Board recommends that the decision documents more fully explain the ecological benefits (including any accelerated recovery) achieved by the various alternatives (in particular, the nature of any added ecological benefits associated with the more aggressive remedial approaches (e.g., REM 0/0/3)).**

The Proposed Plan presents the evaluation of remedial alternatives in terms of protection of both human health and the environment. The Region established a remedial action objective specifically to reduce the risks to ecological receptors by reducing the concentration of PCBs in fish. The Preliminary Remediation Goal for this Remedial Action Objective is a range from 0.3 to 0.03 ppm total PCBs in fish (whole body), based on the Lowest Observed Adverse Effect Level and the No Observed Adverse Effect Level for consumption of fish by the river otter. The river otter was selected from among the representative species evaluated in the Revised Ecological Risk Assessment because it is the receptor found to be at greatest risk under baseline conditions, due to the high consumption of fish in its diet. Note that the Preliminary Remediation Goal for ecological exposure to fish corresponds to a range from 0.12 to 0.012 ppm in fish fillet and, further, that the Preliminary Remediation Goal for human exposure to fish, 0.05 ppm in fish fillet, falls within this range.

Three of the remaining four Remedial Action Objectives established for the site pertain to protection of the environment as well as to the protection of human health. These Remedial Action Objectives include: 1) reducing PCB levels in sediments to reduce PCB concentrations in surface water that are above standards promulgated under other federal and state environmental laws (i.e., ARARs); 2) reducing the mass of PCBs that are or may be bioavailable; and 3) minimizing the long-term downstream transport of PCBs.

The Proposed Plan discusses the overall protectiveness of each alternative evaluated in detail by quantifying risk reductions to both humans and ecological receptors. In addition to quantifying reductions in risk to the river otter, the Proposed Plan quantifies reductions in risk to the mink. The mink was selected because it is a fish-eating mammal known to be sensitive to PCBs that also was found to be at risk under baseline conditions. The Region also considered presenting the risks to the bald eagle, an upper trophic level fish-eating bird found to be at risk under baseline conditions. However, adult eagle risks are much lower than otter risks, and eagle egg risks are similar to but slightly lower than otter risks. Therefore, reductions in risks for the bald eagle are not presented.

Implementation of the active alternatives (CAP-3/10/Select, REM-3/10/Select and REM-0/0/3) results in 64% to 86% reduction in risks to the river otter and mink compared to the modeled No Action alternative and 82% to 93% reduction in risks to the river otter and mink compared to the upper bound estimate for the No Action alternative. The risk reduction offered by the most extensive alternative, REM-0/0/3, is only slightly greater (i.e., 4% to 8%) than the risk reduction offered by the preferred alternative, REM-3/10/Select.

Other receptors evaluated in the Revised Ecological Risk Assessment, such as benthic invertebrates and local populations of forage fish, omnivorous fish, piscivorous fish, insectivorous birds, waterfowl, piscivorous birds, and insectivorous and omnivorous mammals, were found to be less at risk under baseline conditions than piscivorous mammals, as represented by the river otter and mink, and therefore are generally expected to be at acceptable levels of risk under the preferred alternative.

The Proposed Plan also quantifies the relative reduction in PCB load transported from the Upper Hudson River over the Federal Dam at Troy into the Lower Hudson River for each remedial alternative. The reduced PCB load over the Federal Dam ultimately will reduce the concentrations of PCBs in fish, sediment, and water in the Lower Hudson which, in turn, will result in reduced risks to humans and ecological receptors living in and near the Lower Hudson (153 miles of the site). The Region did not quantify the relative risk reductions in the Lower Hudson associated with the reduced PCB load because its fate, transport, and bioaccumulation models were developed for, and calibrated to data collected from, the Upper Hudson River. However, to quantify reductions to human and ecological risks in the Lower Hudson River under the various remedial alternatives, the Region is evaluating the appropriateness of using, in part, a model prepared for the Hudson River Foundation by Dr. Kevin Farley et al., as was utilized for the baseline risk assessments.

While REM-0/0/3 provides the greatest risk reduction among the alternatives evaluated in detail, the Region identified REM-3/10/Select as its preferred alternative because, among other reasons, REM-3/10/Select is considered the most cost-effective alternative.

- **The package is unclear regarding how the actions proposed for the first 40 mile reach of the Upper Hudson are expected to impact the rest of the NPL site (i.e., the 160 river miles below the Federal Dam at Troy, New York (Lower Hudson)). The Board recommends that the Region clearly describe in the site decision documents the estimated benefits of the alternative actions to the Lower Hudson (e.g., explain how reducing mass loadings to the Lower Hudson will affect human health and/or ecological risks) since**

**these estimates will help to more accurately characterize the cost effectiveness of any proposed action.**

As indicated above, the Proposed Plan presents the relative reduction in PCB load transported from the Upper Hudson into the Lower Hudson associated with each alternative. In 2011, the predicted Tri+ PCB load over the Federal Dam is 104 kg under No Action, 72 kg under MNA, 43 kg under CAP-3/10/Select, 42 kg under REM-3/10/Select, and 34 kg under REM-0/0/3. Therefore, the CAP-3/10/Select alternative results in a 40% reduction of PCB loading in the year following completion of remediation compared to the MNA alternative; the REM-3/10/Select alternative results in a 42% reduction in 2011 compared to the MNA alternative; and the REM-0/0/3 alternative results in a 53% reduction of PCB loading in 2011 compared to the MNA alternative. The comparison of the active alternatives to the No Action alternative would show even greater reductions, because the No Action alternative does not assume additional source control near the GE Hudson Falls plant. The reduced PCB load over the Federal Dam ultimately will reduce the concentrations of PCBs in fish, sediment and water in the Lower Hudson, and therefore will reduce risks to human health and ecological receptors living in and near the Lower Hudson. As noted previously, the Region is evaluating the appropriateness of quantifying relative risk reductions to humans and ecological receptors in the Lower Hudson River using the Farley et al. model.

- **As presented, the selected PRG for fish tissue for human consumption (i.e., 0.05 ppm) would not be met in Section 1 or 2 of the Upper Hudson under any of the identified alternatives within the modeled time frame extending to 2067. The Board recommends that the Region address how, where and when this PRG (or alternate goal(s)) would be met by the preferred alternative.**

As stated in the Proposed Plan, the preferred alternative is expected to meet the Preliminary Remediation Goal, or PRG, of 0.05 ppm in fish fillet (wet weight) in River Section 3 (29 miles long, or 73% of the Upper Hudson) by 2052. The preferred alternative will reduce the PCB load over the Federal Dam at Troy, which will reduce the site risks to humans and ecological receptors in the Lower Hudson. The 0.05 ppm Preliminary Remediation Goal is not expected to be attained in the first 11 miles of the Upper Hudson (River Sections 1 and 2) within the modeled time frame (i.e., by 2067) under any of the alternatives evaluated in detail, including the preferred alternative, unless the upstream source of PCBs to the river is virtually eliminated. If the additional source control actions prove to be more effective than was assumed, the likelihood of meeting this Preliminary Remediation Goal increases.

In the Proposed Plan, the Region identifies target concentrations of 0.4 ppm and 0.2 ppm in fish fillet (wet weight) in addition to the 0.05 ppm PRG. The 0.4 ppm target concentration is protective of an adult consuming about a half-pound fish meal every two months, which is the average fish consumption rate reported by anglers in a 1991 New York State Angler survey. The 0.2 ppm target concentration is protective of an adult consuming about a half-pound fish meal every month. These higher concentration targets in fish represent points at which state fish consumption advisories and fishing restrictions might become less stringent (e.g., the current “eat none” advisory in the Upper Hudson River could be relaxed as conditions improve). Under the preferred alternative, the 0.4 ppm target concentration is expected to be attained in fish averaged over the entire 40 miles of the Upper Hudson (River Sections 1, 2, and 3) within 20 years and the 0.2 ppm target is expected to be attained within 35 years.

- **The Board notes that a significant portion (i.e., more than two-thirds) of the cost of the preferred remedy is for off-site transportation and disposal. The Board also realizes that there is strong public opposition to siting of a disposal facility in the Upper Hudson area and, for this reason, the option of a local disposal site was eliminated. However, given the potential for cost savings, the Board encourages the Region to continue to investigate various methods to reduce transportation and disposal costs, including alternative (i.e., more local or regional) disposal sites, and waste volume or toxicity reduction pretreatment options.**

The Region acknowledges the Board's comment involving the substantial costs associated with transportation and off-site disposal of the contaminated sediments. As described in the Proposed Plan, during the screening of technologies and alternatives, the Region eliminated locally-sited landfill options for sediments dredged from the Upper Hudson River. This was based on the administrative infeasibility of siting a local landfill, given the long-standing opposition of local communities to disposal of PCB-contaminated sediments within the Hudson Valley. In recognition of the concerns of the local community, the preferred alternative includes transportation by rail to appropriate permitted disposal facilities outside the Hudson Valley.

The preferred alternative also includes the possibility of a beneficial use for some portion of the dredged materials. The Region will continue to explore ways to reduce the costs of disposal, such as waste volume or toxicity reductions through separation or treatment. The Region will finalize such value engineering to reduce costs during the remedial design.

- **The Board notes that certain *ex-situ* treatment alternatives were identified as cost effective but not carried through as a component of the REM 0/0/3 or**

**REM 3/10/Select alternatives. The Board recommends that those treatment options (e.g., thermal desorption) identified as feasible be further evaluated during design as a means to reduce the cost and volume of sediment requiring off-site disposal.**

In the Proposed Plan, the Region states that treatment technologies, such as thermal desorption, were determined to be technically feasible but were eliminated during the screening analysis for two reasons: 1) the associated costs of such treatment technologies are significantly greater than off-site landfill disposal; and 2) a locally-sited thermal treatment facility would not be expected to be administratively feasible.

- **The Board notes that the placement of one foot of clean backfill in dredged areas contributes approximately 10% to the cost of the preferred alternative. The Region should more clearly explain in site decision documents the need for the backfill (e.g., bank or riverbed stabilization, isolation of residual contamination, providing substrate for ecological recovery, etc.).**

In the Proposed Plan, the Region explains that, for all active alternatives, the placement of the clean backfill in appropriate targeted areas (excluding the navigation channels) is designed to cover any contamination remaining following dredging to further reduce the bioavailability of PCBs in the surface sediment, to provide an appropriate substrate for biota, and to help stabilize bank areas and minimize hydraulic changes to the river.

During remedial design, the Region will assess the appropriateness of eliminating the placement of clean backfill in targeted areas. For example, nearshore fish habitat areas that have become silted-in over time may be better mitigated by not adding clean backfill and leaving a deeper water habitat. The identification of any additional areas where backfill could be eliminated will help to reduce the costs associated with obtaining and placing the backfill.

- **The preferred remedy (REM 3/10/Select) removes three hot spots in River Section 3 for approximately \$40M more than the MNA alternative for this same river section (i.e., 3/10/MNA). The package is not clear as to the relative benefits of this selective hot spot removal as compared to the use of MNA for this section of the river. For example, the modeling does not predict that a significant river system-wide risk reduction will be achieved by this selective removal (although there may be important local benefits, such as habitat restoration, or control of highly unstable contaminated sediment sources). The Region should clarify in the site decision documents the benefits of the River Section 3 component of the preferred alternative.**

In the Proposed Plan, the Region describes the results of modeling the various combinations of the PCB target levels (e.g., mass per unit area) to evaluate the relative benefits in each section of the river. The model results did not predict substantial benefits from remediation in River Section 3, most likely due to the relatively large scale of the model segments and the sediment texture in this reach.

However, historical data from River Section 3 show that increased concentrations of PCBs in the water column correlate with high flow events in tributaries that empty into the Hudson River. These high flow events caused scour (erosion) of PCB-contaminated sediments in the Hudson River which, in turn, elevated the PCB concentrations in the water column. Therefore, the Region selected certain areas in River Section 3 for remediation that have both significant PCB inventory and the potential for loss of that inventory by erosion (i.e., hot spots 36, 37, and the southern portion of 39).

- **All remedial options rely on monitored natural attenuation (i.e., natural recovery) to help achieve target fish tissue concentrations. However, the package is unclear about the importance of the various MNA mechanisms identified. The Board recommends that the Region clarify in the decision documents the more significant MNA processes and how they are expected to contribute to achieving these fish tissue concentration goals.**

In the context of the Hudson River PCBs Site, MNA refers to reliance on natural biological, physical, and chemical processes within a monitored site cleanup approach. Under the preferred alternative, MNA is implemented after active remediation (i.e., dredging). In the Proposed Plan, the Region explains that the natural attenuation processes for the Hudson River PCBs Site may include biodegradation, biotransformation, bioturbation, diffusion, dilution, adsorption, volatilization, chemical reaction or destruction, resuspension, downstream transport, and burial by clean sediment. The relative importance of each of these mechanisms in reducing PCB concentrations in Hudson River fish is not easily estimated based on the available data. Some or all of these processes may be occurring at any given time and location within the river. Through the monitoring program, the Region expects to measure the net effect of all of the natural attenuation processes until the PRGs are reached.

- **Currently, areas targeted for remediation are identified primarily based on engineering criteria. The Board notes that especially sensitive ecological habitats in the Upper Hudson may be impacted by PCB contamination that have not yet been identified. The Board recommends that for the preferred alternative (i.e., REM 3/10/Select), the Region consider including among these engineering-based criteria, factors that could recognize especially**

**sensitive or unique habitats. For example, in certain instances, such factors might suggest extending the scope of the action where it is practicable to do so to include otherwise excluded but especially important or productive habitat areas.**

In the Proposed Plan, the Region notes that 39 areas in the Lower Hudson River have been identified as either significant coastal fish and wildlife habitats or containing important plant and animal communities. The Region will consult with appropriate federal and state agencies in determining whether any especially sensitive or unique habitats exist in the Upper Hudson River that warrant special consideration during remedial design.

In closing, the Region appreciates the Board's review of the information package for the Hudson River PCBs Site and the recommendations presented in its December 5 memorandum. If you have any questions regarding this matter, please do not hesitate to contact me at 212-637-4390.

cc: T. Fields (OSWER)  
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